About Los Alamos

As the senior laboratory in the DOE system, the Laboratory executes work in all of DOE's missions: national security, science, energy, and environmental management. Our contributions are part of what makes DOE a science, technology, and engineering powerhouse for the nation.

About Chemistry Division

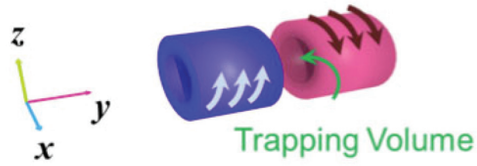
With five groups and a staff of nearly 300, the Chemistry Division serves the Laboratory's missions with innovative chemical science and technology for energy research, threat identification and mitigation, weapons science, health, space research, and much more.

Our capabilities are also essential for the emerging mission areas of energy security, civilian-sector R&D, and industrial partnering.

We have expertise in

- Actinide chemistry
- Isotope science
- Synthetic and mechanistic chemistry
- Chemistry for measurement and detection science
- Chemistry of materials
- Data analysis and modeling for chemical sciences
- Radiochemistry and nuclear science

Over the years, many of our postdoctoral fellows have joined the Laboratory as technical staff members. Others have gone on to academic, research, national laboratory, or industrial appointments.



Staff recently demonstrated the feasibility of a new approach to the trapping of cold atoms and molecules. They posited and successfully modeled accumulators for laser-cooled neutral atoms and molecules, analogous to those used in particle sources for high-energy physics. Such an accumulator, when achieved, could allow experiments in cold-particle quantum physics and chemistry that are outside the reach of present methods.

Opportunities

Chemistry Division offers opportunities across the employment spectrum, from student positions, to graduate and postdoctoral fellowships, to mid-career research positions. We also have active programs in industrial partnering.

Learn more about Chemistry Division:
http://www.lanl.gov/org/padste/adcles/chemistry/

Physical Chemistry and Applied Spectroscopy group
office: (505) 667-7121
Chemistry Division Office: (505) 667-4457

Cover: Core/shell PbSe/CdSe quantum dots (a) and a carrier multiplication (CM) pathway (b) in these nano structures. (a) Transmission electron microscopy image of thick-shell PbSe/CdSe quantum dots developed for this study. (b) A hot hole generated in the shell via absorption of a photon collides with a core-localized valence-band electron, promoting it across the energy-gap, which generates a second electron-hole pair. In thick-shell PbSe/CdSe quantum dots this process is enhanced due to slow relaxation of shell-localized holes into the core.

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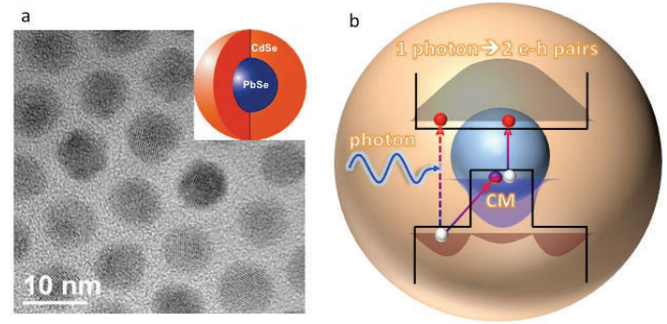
CHEMISTRY

Physical Chemistry and Applied Spectroscopy Group (C-PCS)



Quantum dots are leading to novel solar cells.

C-PCS focuses on research problems that require an integrated approach involving scientific, engineering, and modeling disciplines in physical chemistry and applied spectroscopy. We perform basic and applied research in support of the Laboratory's national security mission and serve a wide range of customers.

Los Alamos
NATIONAL LABORATORY

Capabilities

Remote Sensing Applications

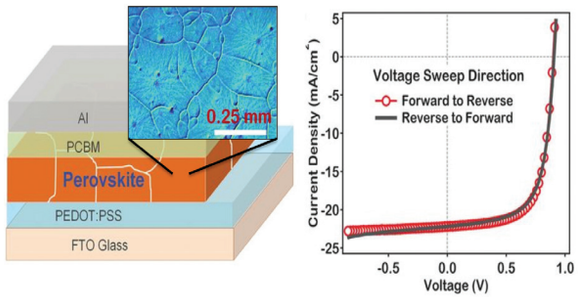
C-PCS's Remote Sensing Applications team develops remote sensing technologies and algorithms. We design and field new types of remote sensing instruments whose aim is to detect optical signatures of importance in proliferation detection and other defense missions such as battlefield threats and intelligence gathering. Theoretical research is aimed at the development of detection algorithms (for gas chemicals, solid materials, and others) to extract signals from high levels of background clutter.

Nanotechnology and Advanced Spectroscopy

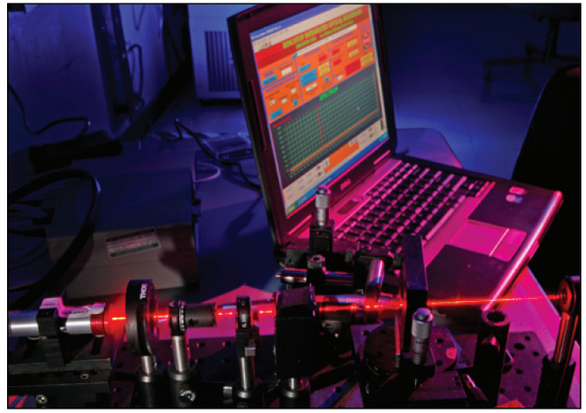
This team examines the synthesis and characterization of semiconductor and metal nanoparticles, composites and assemblies, and their application in optoelectronic devices. This world-recognized effort is fully integrated, combining extensive wet-chemical synthesis and assembly capabilities with nearly unmatched advanced spectroscopic resources. The LANL component of the new Center for Advanced Solar Photophysics is housed within this team.

Weapons Chemistry & Chemical Physics

The Weapons Chemistry team researches topics important to the safety and surety of our nation's nuclear weapons. Our major topics include the study of energetic materials and plutonium chemistry in regards to certification processes. We also are active in chemical process development from bench-scale studies to the design and demonstration of integrated flow systems. Our ultracold research programs cover topics in general chemical physics, inspired by the fact that chemistry and physics are often profoundly different at temperatures below 1 mK.



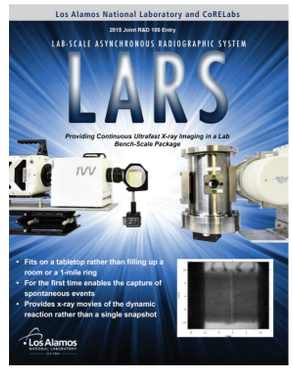
C-PCS researchers developed a new solution-based hot-casting technique for fabricating highly efficient and reproducible solar cells from large-area perovskite crystals. The cells demonstrate little cell-to-cell variability, with hysteresis-free photovoltaic response, which had been a fundamental bottleneck for stable operation of perovskite devices.



This ultra-sensitive, fieldable biosensor is a multiplex, multi-channel detection system that uses photo-stable and tunable quantum dots. It detects cholera toxin, influenza, anthrax, tuberculosis, breast cancer, *E.coli*, and other agents using single mode waveguides.

Synthesis and Physics of Integrated Nanomaterials

This team seeks and applies intricate control of the structure of functional chemicals and materials, with a focus on conjugated organic systems, carbon nanotubes and biomaterials. In addition, this team develops advanced spectroscopy and spectral microscopy tools for the study of these materials in the context of energy harvesting and storage devices, and advanced detection platforms.

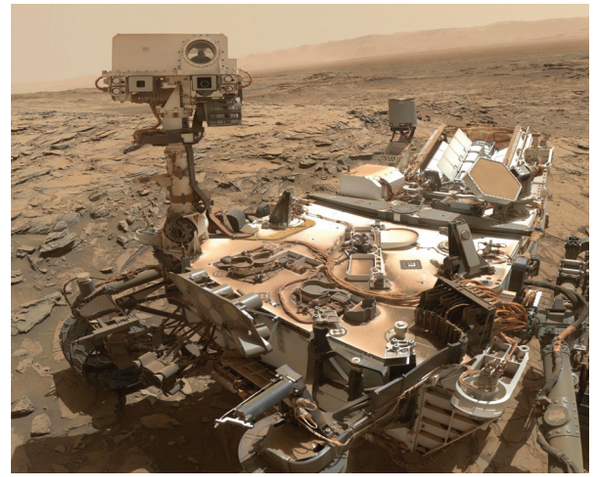


The Lab-scale Asynchronous Radiographic System (LARS) is a small-scale radiography device for continuous high-speed x-ray imaging of spontaneous dynamic events. It was a finalist for the prestigious R&D 100 Award.

Chemistry for Biomedical Applications team members are providing technical expertise to local industry for the development of a large-scale, multi-stage, continuous process for the growth of an algae that produces the nutritional supplement astaxanthin.

Chemistry for Biomedical Applications

This team focuses on the application of physical and organic chemistry concepts to biomedical applications. The work spans basic research on the nature of protein function and the production of high value chemicals from algae, to applied research supported by a variety of sponsors on the sensitive and specific detection of biomarkers of disease in humans and animals, and the development of integrated global biosurveillance systems.



C-PCS researchers helped develop and manage ChemCam, a one-of-a-kind laser-induced breakdown spectroscopy (LIBS) instrument on the NASA Mars Rover "Curiosity."